# International Journal of

# **ELECTRONICS**

## Theoretical and Experimental

Editor: P. A. LINDSAY, D.Sc(Eng.), Ph.D., F.C.G.I., C.Eng., F.I.E.E., F.Inst.P.

Associate Editors: PROFESSOR V. L. GRANATSTEIN, B.S., M.S., Ph.D. (U.S.A.)

PROFESSOR H. L. HARTNAGEL, D.Eng., Ph.D., Dipl.-Ing. (Continental Europe)

PROFESSOR SHOICHI ONO, B.E., M.S., D.Eng. (Japan)

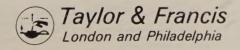
Consultant Editor: PROFESSOR SIR NEVILL MOTT, M.A., D.Sc., F.Inst., F.R.S.

#### Editorial Board

France	Professor P. AIGRAIN
U.K	Dr. J. E. ALLEN
West Germany -	DrIng. J. BRETTING
U.S.A	Professor M. CHODOROW
U.K	Professor K. G. EMELEUS
France	Dr. M. GOLDMAN
West Germany -	Professor Dr.rer.nat. W. HARTH
U.K	Professor C. A. HOGARTH
U.S.A	Dr. H. KOGELNIK
U.S.A	Dr. J. M. LAFFERTY
U.K	C. A. MAY
U.K	D. H. ROBERTS
U.S.A	Professor L. D. SMULLIN
U.K	Dr. D. T. SWIFT-HOOK
U.K	P. E. TRIER
Japan	Dr. M. UENOHARA
Sweden	Professor P. WEISSGLAS
U.S.A	Professor J. R. WHINNERY

## Volume LXI

July 1986 to December 1986



#### Subscription Information

Published monthly

Annual subscription 1987 £280 DM 1120 US \$530

ISSN 0020 7217

Dollar rates apply to USA, Canada and Mexico. Deutschmark rates to FR Germany. Sterling rates apply to the UK and all other areas.

All subscriptions are payable in advance and all rates include postage. Journals are sent by air to the USA, Canada and Mexico, India and Australasia. Subscriptions are entered on an annual basis, i.e. from January to December. Payment may be made by sterling cheque, dollar cheque, international money order or National Giro, or by credit card (AMEX, VISA, Mastercard/Access).

Orders originating in the following territories should be sent direct to the local distributors

Australia R. Hill & Son Ltd, 117 Wellington Street, Windsor, Victoria 3181.

India Universal Subscription Agency Pvt. Ltd, 101-102 Community Centre, Malviya Nagar Extn Post Bag No. 8,

Saket, New Delhi 110017.

apan Kinokuniya Company Ltd, Journal Department, PO Box 55 Chitose, Tokyo 156.

New Zealand R. Hill & Son Ltd, Private Bag, Newmarket, Auckland 1.

USA, Canada and Mexico Taylor & Francis Inc., 242 Cherry Street, Philadelphia, Pennsylvania 19106-1906.

UK and all other territories Taylor & Francis Ltd, Rankine Road, Basingstoke, Hampshire RG24 OPR.

Air freight and mailing in the USA by Publications Expediting Inc., 200 Meacham Avenue, Elmont, New York 11003. Second class postage paid at Jamaica, New York 11431. US Postmaster: Send address changes to *International Journal of Electronics*, Publications Expediting Inc., 200 Meacham Avenue, Elmont, New York 11003.

200 Meacham Avenue, Elmont, New York 11003.

Published by Taylor & Francis Ltd. 4 John Street, London WC1N 2ET, UK. Printed by Taylor & Francis (Printers) Ltd. Rankine Road, Basingstoke, Hampshire RG24 0PR, UK.

#### Copyright @ 1986 Taylor & Francis Ltd

All rights reserved. Authors are themselves responsible for obtaining permission to reproduce copyright material from other sources and are required to sign a form for agreement of the transfer of copyright. All requests from third parties to reprint material held in copyright by Taylor & Francis must be referred to the author for consent as a condition of the granting by Taylor & Francis of permission for reproduction. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form, or by any means, electronic, electrostatic, magnetic, mechanical, photocopying, recording or otherwise, without prior permission in writing from the copyright holder. 0020–7212/86 \$3-00 © 1986 Taylor & Francis Ltd.

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Taylor & Francis Ltd for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee is paid directly to CCC, 27 Congress Street, Salem, Massachusetts 01970, USA, (For fee per article see copyright code above.) This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising, for creating new collective works, or for resale. Fees for past articles are the same as those shown for current articles.

## CONTENTS OF VOL. LXI (Nos. 1-6)

#### NUMBER 1-JULY

- 1 Some electrical properties of thin films of the complex material SiO/GeO<sub>2</sub> showing the effects of electroforming. A. S. MD. RAHMAN and C. A. HOGARTH
- 13 Two-element cylindrical antenna in a warm plasma. Y. Morita
- 27 Electron-wind associated electromigration in metal conductors on GaAs surfaces. B. R. Sethi and H. L. Hartnagel
- Threshold power transfer for the gyrotron and peniotron oscillators operating at the harmonic cyclotron frequencies using coaxial electron beam-circuit configurations. U. A. Shrivastava, R. W. Grow, P. S. Rha, J. M. Baird and L. R. Barnett
- 61 Spectrum of pulse interval and width modulation. S. A. ABDULLAH and R. S. FYATH
- A spectral characterization of the self-dualized classification of boolean functions. D. M. MILLER and J. C. MUZIO
- 73 On the possibility of controlling non-stationary annealing characteristics in a stationary environment. T. M. AGAHANYAN, YE. R. ASTVATSATURYAN and A. I. CHUMAKOV
- 79 Binary-to-residue and residue-to-binary converters. S. N. SALOUM and K. M. IBRAHIM
- New high performance two-phase clock generation circuits. Y. C. Lim, C. C. Ko and H. Singh
- 91 Simple one-shot multivibrator for low voltage power supply. I. M. FILANOVSKY and V. A. PISKAREV
- 97 Foldable compatibility matrix for the folding of programmable logic arrays. N. N. BISWAS
- 105 A study in generation and detection of amplitude-modulated signals using sine-wave crossings technique. R. S. FYATH
- New geometrical shape code and its optical recognition scheme. M. K. R. HABIB, M. A. SID-AHMED and H. F. EL-SAYED
- 129 Constant factor incremental delta modulator. V. D. MYTRI and A. P. SHIVAPRASAD

Research note
137 New TTL oscillator without external capacitors. M. T. ABUELMA'ATTI and
W. A. ALMANSOURY

#### NUMBER 2-AUGUST

- 143 Invited paper. Review of solid state power devices and circuits for HF electric process heating applications. Part I devices. S. HINCHLIFFE and L. HOBSON
- 169 Invited paper. A speech entry data logger. A. C. Tsoi and D. K. PATEL
- 191 Statistical distribution of random electric fields in charged particle gases. H. E. WILHELM
- 197 Amplitude control in a twin-T bridge RC-oscillator using a window comparator. I. M. FILANOVSKY and K. A. STROMSMOE
- 207 The two-layered annular-ring microstrip antenna. K. F. Lee and J. S. Dahele
- 219 Gridded square frequency-selective surfaces. T. S. Mok and E. A. PARKER
- 225 Current-controlled translinear IPIC. G. NORMAND
- 233 Electronically tunable first-order OTA-capacitor filter sections. I. A. Khan and M. T. Ahmed
- 239 An algorithm for simultaneous transmission of speech and data. P. C. CHING and Y. H. TAM
- 247 Intermodulation arising from electron tunnelling in MIM junctions. M. T. ABUELMA'ATTI

#### Research notes

- 251 Cratering of glass surfaces exposed to a positive column plasma. K. G. EMELEUS and J. R. M. COULTER
- 255 New voltage-controlled active-R oscillator. M. T. Abuelma'atti and W. A. Almansoury

#### NUMBER 3—SEPTEMBER

- Invited paper. Review of solid state power devices and circuits for HF electric process heating applications. Part II circuits. S. HINCHLIFFE and L. HOBSON
- Waves in positive-ion/negative-ion plasmas. K. G. EMELEUS
- Differential current-convertors and current-conveyors using dual operational mirrored amplifiers (dual OMA). G. NORMAND
- Influence of single and multiple-layer dielectric substrates on the band spacings available from a concentric ring frequency-selective surface. E. A. PARKER and J. C. VARDAXOGLOU
- 299 Theory of reflection from bevelled, antireflection-coated semiconductor laser facets. R. H. CLARKE
- Mathematical model of a capacitive-input full-wave power supply. T. D. STRASHIMIROV
- Inverse pulse scattering by a semi-infinite wedge. Z. Y. CHEN and M. HAMID
- Scattering by two parallel multi-layered dielectric cylinders. H. A. RAGHEB and M. HAMID

- An approximate analysis of transient radiation from linear antennas. R. G. MARTIN, J. A. MORENTE and A. R. BRETONES
- Design of a speed regulator electronic system for a DC motor fed from a semi-converter supply. A. IOINOVICI and A. SHENKMAN
- Rectangular pulse-frequency multiplier using phase-locked loop. R. S. FYATH
- Selection and design of inverter output filters for UPS systems. R. M. HILLOOWALA and S. M. SRIRAGHAVAN
- 37 Quaternary multiplexer. G. Krishnan and A. P. Shivaprasad

#### Research note

Modelling the DC characteristics of GaAs MESFETs for CAD. M. T. ABUELMA'ATTI

### NUMBER 4—OCTOBER

- The effects of added CuO on the electrical properties of Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>-Pb<sub>3</sub>O<sub>4</sub> glasses. A. A. KUTUB, K. A. MAGHRABI and C. A. HOGARTH
- Measurement of mutual scattering effects between spheres using a microwave open resonator. B. Mahmid and L. J. Auchterlonie
- 425 Connection operators for block diagram analysis. P. R. Adby
- Noise models for gallium arsenide field-effect transistors at room and cryogenic temperatures. R. C. ROBERTSON and T. T. HA
- 441 Sequential adaptation of recursive digital filters in cascade form. Y. H. TAM and P. C. CHING
- 449 Simple two-sections model for short channel MOS transistors in saturation. H. MIRANDA and M. EL NOKALI
- 459 Input characteristics of the capacitor-input rectifier filter. M. J. CASE
- Application of finite differences to the analysis of diffraction gratings embedded in an inhomogeneous and lossy dielectric. M. K. MOAVENI
- Scattering from dielectric cylinders embedded in a two-layer lossy medium. P. G. COTTIS and J. D. KANELLOPOULOS
- Fast detection of amplitude and frequency of sinusoidal signals using calculus of finite differences. A. I. ABU-EL-HAIJA
- Development of 60A, TO-220-packaged, double -interdigitated (TIL) GTO thyristors with enhanced electrothermal reliability. A. SILARD, F. ŢURŢUDĂU and B. Kosa
- CdS and CdSe thin-film transistors employing 'mixed oxide' as the gate insulator.

  P. SINGH and B. BAISHYA
- ANSWICAP—a computer-aided method for symbolic transfer function determination on switched capacitor networks. J. F. Duque-Carrillo, J. J. Peña-Bernal and J. M. Vega-Fernández
- Serial quaternary-to-analogue converters. G. Krishnan and A. P. Shivaprasad
- A solid-state relay for transformer switching. M. S. Jamil-Asghar, M. Mohibullah and M. Salman Beg

#### NUMBER 5—NOVEMBER

- 543 Holding time distribution in dynamic MOS RAMs. P. LECHNER, W. MOHR and A. PAPP
- 555 Space-charge-limited currents in evaporated polypropylene. T. IQBAL and C. A. HOGARTH
- 561 Some electrical properties of germanate glasses containing praseodymium and chlorine. A. A. KUTUB, A. E. MOHAMED-OSMAN and C. A. HOGARTH
- Determination of slow surface states in semiconductors by a surface acoustic wave technique. H. BAUDRAND, T. E. TAHA and M. AHMADPANAH
- 575 A model for the parasitic oscillations in power tetrodes. L. Egerszegi, D. Kuse and M. Q. Tran
- 583 Virial theorems for electromagnetic fields. E. F. KUESTER
- 597 Evaluation of relative permittivity and conductivity of forest slab from experimentally measured data on lateral wave attenuation constant. R. K. TEWARI, S. SWARUP and M. N. ROY
- Performance of a dual-band reflector antenna incorporating a frequency selective subreflector. C. K. Lee and R. J. Langley
- A linearized model of a twin-T RC oscillator employing an amplitude control system with multipliers. G. J. FORTIER and I. M. FILANOVSKY
- Analysis of electric fields in very shallow silicon junctions. A. P. SILARD and M. J. Duță
- 639 Array of matched, linear antennas fed by pulsed signals. R. G. Martin, J. A. Morente and A. R. Bretones
- 647 Some approximation methods for dielectric-loaded waveguides. X. Yansheng
- 655 A novel analytical threshold voltage model of MOSFETs with implanted channels. A. Dasgupta and S. K. Lahiri
- 671 A matrix codec as a finite server in a queueing system. D. C. VOUKALIS
- Measurement of the equivalent capacity of a discharge tube in its active state. G. Singh and L. S. Gour
- 686 Announcement

#### NUMBER 6—DECEMBER

- 687 Contents
- 689 Guest editorial
- 691 Foreword
- 693 Applications for gyrotrons in fusion research. A. C. RIVIERE
- 697 Gyrotron development in the framework of the European Fusion Programme. J. P. RAGER

- 701 CW operation of a 140 GHz gyrotron. K. Felch, R. Bier, L. J. Cragi, H. Huey, L. Ives, H. Jory, N. Lopez and S. Spang
- 715 A 100 GHz gyrotron—results and future prospects. G. Mourier, G. Faillon and P. Garin
- 729 A TE<sub>1,3</sub> gyrotron at 85 GHz. M. RHINEWINE and M. E. READ
- Parameter studies for a 150 GHz gyrotron operating in the TE031 mode. E. Borie, B. JÖDICKE and O. DUMBRAJS
- 747 Gyrotron efficiency calculations based on a non-sinusoidal asymmetrical field distribution. H. Döring and J. Luginsland
- 757 A gyrotron with a minimum Q cavity. H. Saito, K. Kreischer, B. G. Danly, T. M. Tran and R. J. Temkin
- 771 RF field profiles in weakly irregular open resonators. J. J. Barroso, A. Montes and G. O. Ludwig
- Boundary integral method for computing eigenfunctions in slotted gyrotron cavities of arbitrary cross-sections. S. W. McDonald, J. M. Finn, M. E. Read and W. M. Manheimer
- Effect of AC and DC transverse self-fields in gyrotrons. T. M. ANTONSEN, W. M. MANHEIMER and B. LEVUSH
- 855 Space-charge instabilities in gyrotron beams. A. Bondeson and T. M. Antonsen
  - Influence of thermal spread on space-charge limiting current. T. Antonsen Jr and B. Levush
- Theory of non-stationary processes in gyrotrons with low *Q* resonators. N. S. GINZBURG, G. S. NUSINOVICH and N. A. ZAVOLSKY
- Analytical treatment of linearized self-consistent theory of a gyromonotron with a non-fixed structure. H. Saito, T. M. Tran, K. E. Kreischer and R. J. Temkin
- 905 A ballistic calculation for gyrotron interaction. C. J. EDGCOMBE

871

- P. A. LINDSAY and R. M. JONES

  One observations on gyrotron interaction models III. Gyro-oscillators.
- Measurement of frequency shift in a gyrotron oscillator. R. M. Jones and P. A. LINDSAY
- Magnetron injection gun (MIG) design for gyrotron applications. J. M. BAIRD and W. LAWSON
- The design of a high peak power relativistic magnetron injection gun. W. LAWSON, J. CALAME, V. L. GRANATSTEIN, G. S. PARK, C. D. STRIFFLER and J. NEILSON
- One dimensional models for relativistic electron beam diode design. J. M. Finn, A. W. Fliflet and W. M. Manheimer
- OO5 Self-consistent field large signal analysis of the gyroklystron. A. Salop and M. Caplan
- Gyroklystron amplifier phase noise measurements. J. McAdoo, W. M. Bollen, A. McCurdy, V. L. Granatstein and R. K. Parker
- Multimode simulation of the frequency spectrum of a quasi-optical gyrotron. M. Q. Tran, A. Bondeson, A. Perrenoud, S. Alberti, B. Isaak and P. Muggli

- 1041 Sub-nanosecond pulselength millimetre wave generation with a phase modulated quasi-optical gyrotron. W. M. Manheimer and M. E. Read
- 1049 Linear and non-linear theory of the Doppler-shifted cyclotron resonance maser based on TE and TM waveguide modes. A. W. FLIFLET
- 1081 Gyro-peniotron focused by radial electrostatic field and axial magnetostatic field. S-C. ZHANG
- 1091 Large-orbit gyrotron with an assistant radial electrostatic focusing-field. S-C. ZHANG and S. LIU
- 1099 The truth about the ripple beam amplifier. M. J. SMITH and V. R. NUTH
- 1109 Polarization converters for circular waveguide modes. J. L. DOANE
- High power mode conversion for linearly polarized HE<sub>11</sub> hybrid mode output. M. Thumm
- 1155 Announcement
- 1157 Subject Index
- 1161 Author Index